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DIAGNOSIS AND TREATMENT OF FRACTURES OF THE NECK OF THE FEMUR.

ROYAL COLLEGE

ON THE DIAGNOSIS AND TREATMENT OF FRACTURES OF THE NECK OF THE FEMUR.

Being the Introduction to a Discussion in the Section of Surgery at the Annual Meeting of the British Medical Association held in London, July-August, 1895.

BY

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DIAGNOSIS AND TREATMENT OF FRACTURES OF THE NECK OF THE FEMUR.

The first subject which has been selected for discussion by the Council of the Surgical Section on the present occasion may not possibly have the same attractions as one more closely identified with recent surgical development, as, for example, the surgery of the brain, the thorax, or the renal organs. It is desirable, however, in the interests and advancement of our art, that the surgical student, as well as the student of sculpture or painting, should at times look back, contemplate, and study the work of his predecessors, observing how much has stood the test of time and experience; and in some instances noting perhaps how rash it is to generalise from insufficient data, while observing that what remains permanently accepted is the result of no mere chance discovery, but of long, careful, and accurate observation. Some time ago the opinion was expressed to me by a surgical friend of ability that the amount of brain power that has been expended in attempting to form an accurate estimate of the diagnostic signs and symptoms attending certain bone lesions, notably fractures and contusions of the lower end of the radius, of the fibula, and of the upper third of the femur, by what he considered to be an unnecessarily close investigation of minute pathological variations, is quite in excess of the importance of the subject, considered either in a practical or scientific point of view. In this opinion I could not concur, holding that so long as the dense mists which still unhappily obscure many of these injuries, especially those of the cervix femoris, rendering it often difficult, in truth well nigh possible, to estimate and differentiate with exactitude the protean forms of injury that are met with there, so long will it be necessary to continue the system of accurate investigation and close analysis, of which such signal examples have been given us by the splendid work in this direction of Sir Astley Cooper, A. Colles, Dupuytren, Malgaigne, R.W. Smith, Adams, Humphry, Bryant, Gordon, and others.

It should ever be borne in mind by those disposed to make little of such investigations that, if a subject is worth working out at all, too minute a consideration cannot possibly be given to it; and this would especially apply to the practical aspect of the topic to be discussed to-day, as there are few injuries, or groups of injuries, in which accuracy of diagnosis is more important or more imperatively called for. I am not vain enough to hope that any remarks I may make to-day will materially advance our knowledge or much increase our powers of differentiating the characteristic signs and symptoms of these injuries, and it seems to me my function on the present occasion should be mainly to point out the limits that have been reached, and some of the principal landmarks that have been given for our guidance, trusting that those who follow me may erect others, by which we may hope to advance further.

From the preceding remarks it may, perhaps, be thought that as regards difficulties of diagnosis I have given too gloomy a picture of the situation; that I regard it somewhat in the light of an impenetrable jungle in which reliable landmarks are still wanting. When we remember, however, that in these injuries at times many of the signs and symptoms of fracture may be present without the occurrence of any such lesion, and that, on the other hand, fractures may exist without many of these signs and symptoms, it should hardly, I think, be considered that I have expressed myself in any exaggerated manner. There is, in

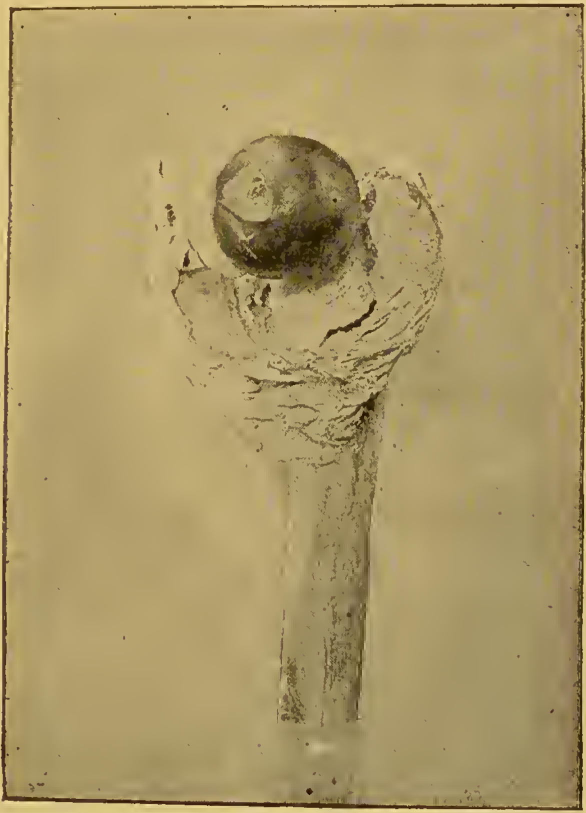

Fig. 1.—Fracture with exuberant bone growth.

truth, no group of fractures in the vicinity of a joint in which there is greater variation in the signs. In the majority of cases there is more or less shortening of the limb, in others it is scarcely perceptible, and in one form it has been said that even slight lengthening may occur. In most cases there is eversion and abduction of the limb, but in others there is neither one nor the other, and in a third group there is inversion and adduction. In some there is pain, and in others a comparative freedom from it. Immediate shortening of the limb occurs as a rule in fractures of the cervical base, but it frequently

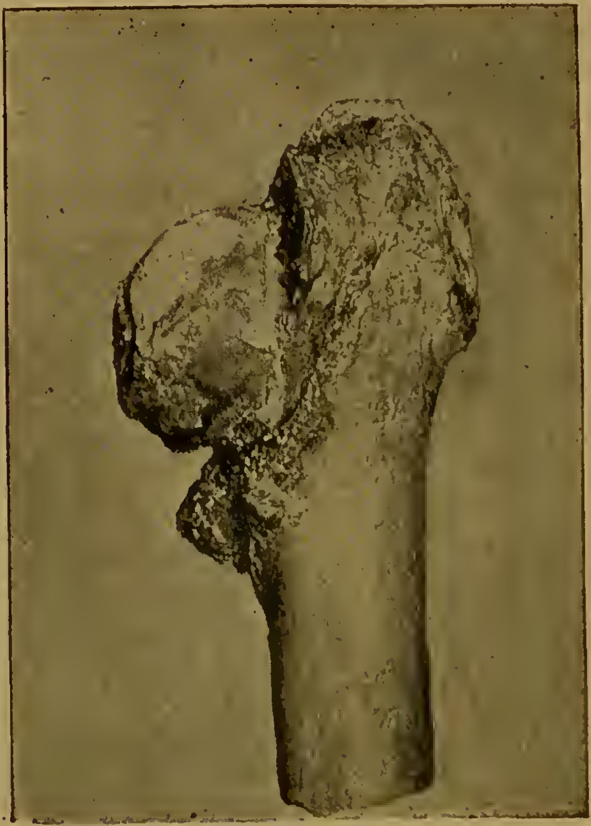

Fig. 2.—Fracture with absorption of cervix.

happens in fractures of the cervix that it is a subsequent secondary development. In fractures of the base impaction occurs in some cases and is absent in others, whereas in the cervix proper we have, as I think, not impaction but penetration. In some instances the fracture is the result of a fall, and in others the fall is the result of the fracture. In one group exuberant new bone growths are the rule, whereas in the other absorption of bone is usually observed. Death from hæmorrhage in fractures of the base has been noted by Cruveilhier, R. W. Smith, Vidal, and others, but I am not aware that it has been observed

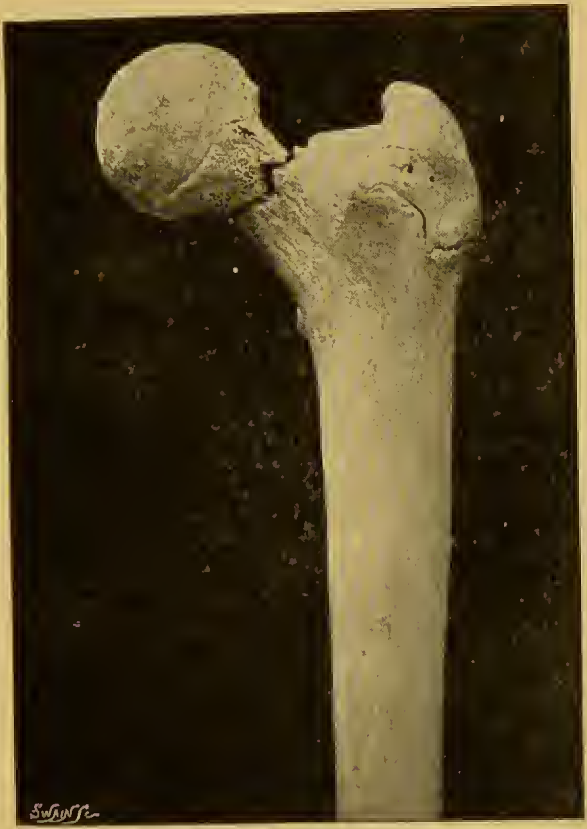

Fig. 3.—Fracture of cervix before union of epiphyses.

in connection with fractures of the cervix. Comminution is a frequent complication in one group, but is rarely if ever observed in the other. Fractures of the cervix are met with as a rule in the more advanced periods of life, although rare cases, such as that shown in Fig. 3 (for which I am indebted to Mr. Bland Sutton, and which is taken from a specimen in the museum of the Middlesex Hospital) prove that they may be met with even before the junction of the epiphyses. Somewhat similar cases have been observed by Morgagni, Stanley, and Hamilton. Lastly, the more serious of these injuries, both as regards imme-

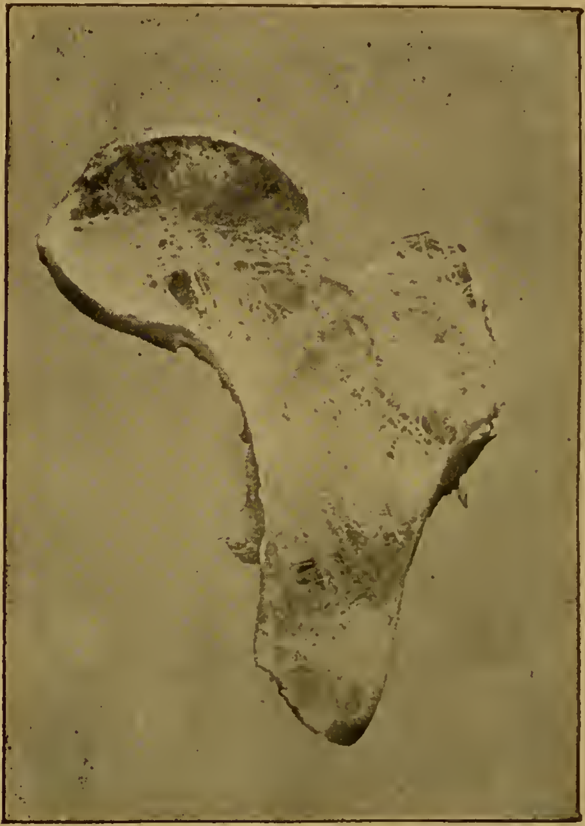

Fig. 4.—Senile osteoporosis.

diate and remote consequences, is often the result of trivial force indirectly applied—a greater force as a rule producing the less serious fracture.

All these circumstances tend to prove the truth of R. W. Smith's dictum, that "Each particular symptom of fracture of the neck of the femur separately considered must be looked upon as equivocal; the union of all can alone lead to the formation of a correct opinion as to the nature and seat of the injury."

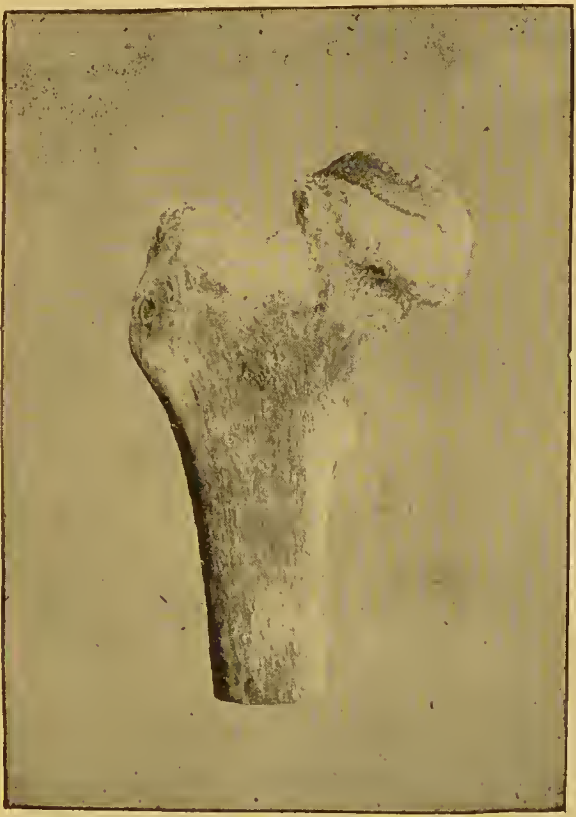

Fig. 5.—Fracture of cervix with penetration of cervix into head.

Before discussing any of the points connected with the classification or differential diagnosis of fractures of either the cervix or its base, I should like to say a few words in reference to some anatomical details which are called for, having regard to the fact that one structure in the joint, and that in my opinion the most important in a surgical point of view, is in many, indeed most, of the modern surgical text-books practically and strangely ignored. I allude to the fibro-synovial envelope of the cervix, to which attention was, I believe, primarily given by the late Mr. Stanley, and my former master, Professor R. W. Smith, the so-called cervical ligament, with which I think their names might properly be associated. In a case of fracture of the cervix, it is not too much

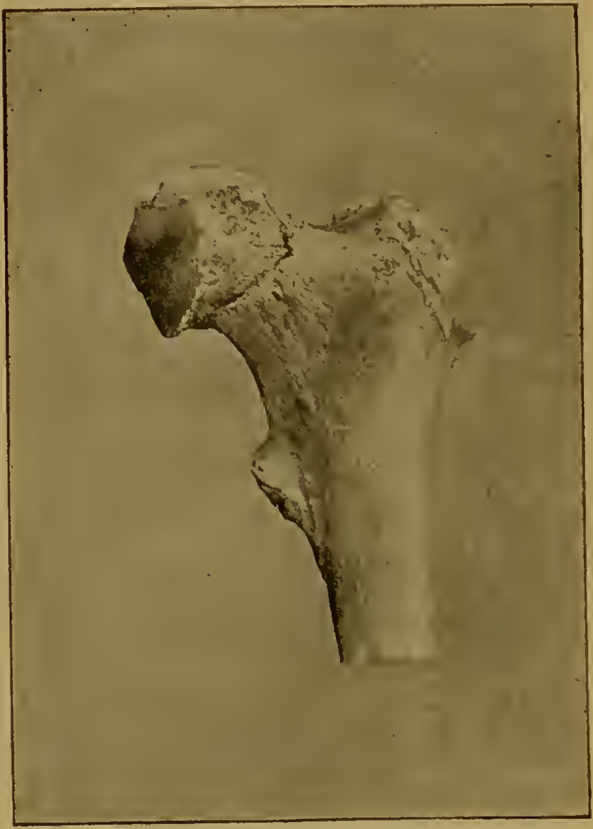

Fig. 6.—Fracture of cervix with reciprocal penetration.

to say that on the integrity or otherwise of this ligament the outcome of the case mainly depends.

Being an important medium, through which nutrition is supplied to the bone, in most instances already modified by senile changes, if not in its form, in its structure, any injury, such as severe contusion, laceration, or tearing, is certain to be followed by serious consequences, such as inflammation, effusion into the joint, displacement, shortening, non-union and ultimate atrophy. Its osteogenetic properties appear to exist in a very limited degree, and it is covered or lined by what appears to be an exceptionally sensitive

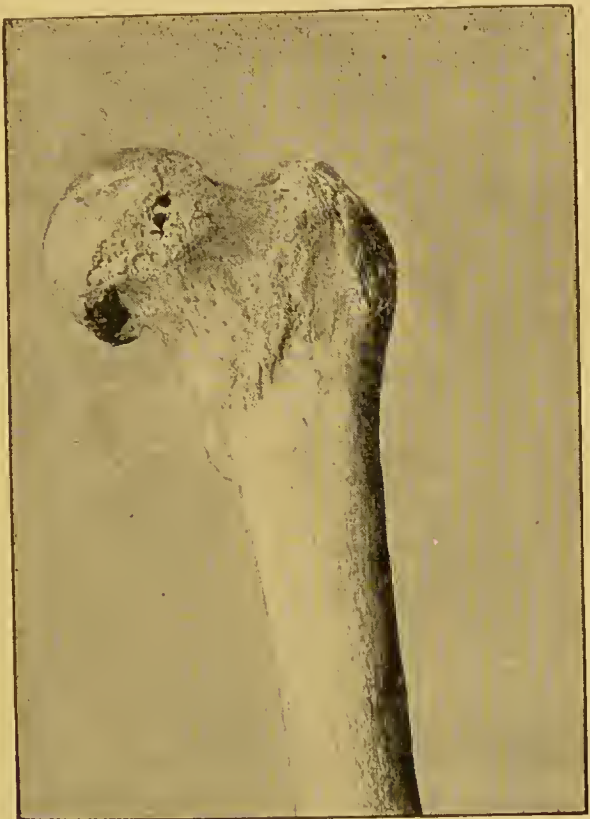

Fig. 7.—Fracture of cervix at junction with head.

synovial membrane. In its fibrous structure there is no uniformity as regards thickness and strength, for in some situations, especially in front, the strong bands can be observed, the "retinacula" of Weitbrecht, thus resembling the capsular ligament of the joint, which is so strengthened on its anterior surface by Bigelow's **Y**-shaped ligament.

The consideration of these facts is a matter not merely of theoretic, but of practical interest, for it is by observing what occurs when the integrity of this ligament is maintained that we are furnished with an index as to the line of treatment we should adopt in cases where it is not so preserved. Upon the latter circumstances depends largely the remarkable variation in the physical characters of fractures of the cervix, as much as the sequelæ of such injuries. Among these, one of the most remarkable is the rapidity and completeness in the interstitial absorption of the cervix, which takes place not alone in cases of fracture, but also in cases where there is no evidence of such having taken place, but only of contusions such as are familiar to everyone who has even made a superficial study of these injuries.

This rapid absorption may be due primarily to senile alteration in the bone tissue, and secondarily to activity of absorption due possibly to traumatic disturbance. It seems to illustrate the fact that in morphological changes the osseous system is one of the most plastic. As an example of this I would point to the readiness with which bones are absorbed owing to the pressure of aneurysms and other tumours, showing that a system which at first sight would seem so much more capable of resistance than other structures, is, as a rule, the first to break down.

Of this condition of absorption many signally beautiful examples are now before us. Mr. Curling * has discussed this point exhaustively. He has pointed out that in the majority of fractures within the capsule, "the periosteum being torn, the circulation is diminished to a greater extent than in other descriptions of fractures, where one division of the bone is deprived of its nourishment from the medullary arteries. The loss, moreover, is not limited to its central structure, but the whole of the detached bone sometimes suffers, and the atrophy, instead of being merely eccentric, occurs throughout its texture—not only the cancelli enlarging, but the size of the head becoming insufficient to fill the acetabulum."

A similar process may, I think, result from impaired nutrition, consequent on synovio-periosteal inflammation without fracture. Certain it is, I think, that many cases have been noted in which atrophy of the cervix occurred without fracture, and was not only a source of error in diagnosis, but also the cause of blame being unjustly attached to the surgeon for not recognising the occurrence of a supposed fracture, the disappearance or diminution of the neck producing many of the apparent signs of fracture.

The process of atrophy and absorption which goes on in these cases is similar, as Curling pointed out, to the thyroid atrophy which takes place following the ligation of one or more of the thyroid arteries or divisions of the isthmus. The atrophy is essentially eccentric, the cancelli and medullary cavity enlarge first, and this is followed by a thinning of the outer shell. In some instances the earthy parts are first removed, and the head of the femur sinks

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* *Med.-Chir. Trans.*, vol. xx, p. 336.

down upon its shaft, but "more commonly the texture remaining is brittle, and the bone gives way on receipt of even a trivial force."

This process of rapid absorption is, in the case of fracture, probably due, in the first place, to senile osteoporosis; and in the second place to the twofold action of the absorbents on the one hand, and friction of the broken fragments on the other; and in the case of contusion, to impaired nutrition, consequent on a low form of synovio-periosteal inflammation.

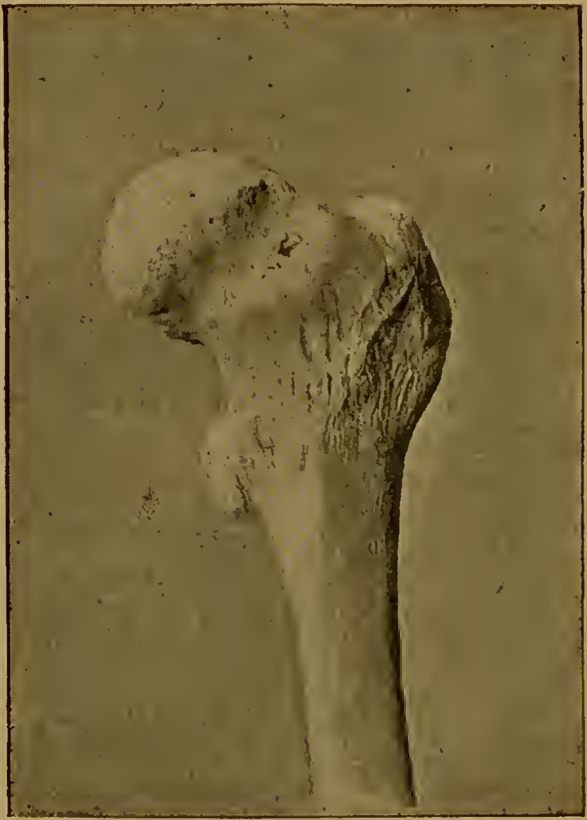

Fig. 8.—Fracture at centre of cervix.

Until recently the generally received opinion, and one accentuated by R. W. Smith, was that an alteration in the angle between the axis of the cervix and the shaft was a frequently observed senile change, this being held to be one of the determining causes of fractures of the cervix in advanced periods of life. The researches, however, of Sir George Humphry, and also of Dr. Charpy, of Lyons, have definitely disposed of this view. According to the latter, the angle between the axis of the cervix and the shaft is in the infant greater than in that of the adult; but once adult life is reached, no further change in the angle is observable. There can be no doubt that an alteration in the angle has been observed in old femora,

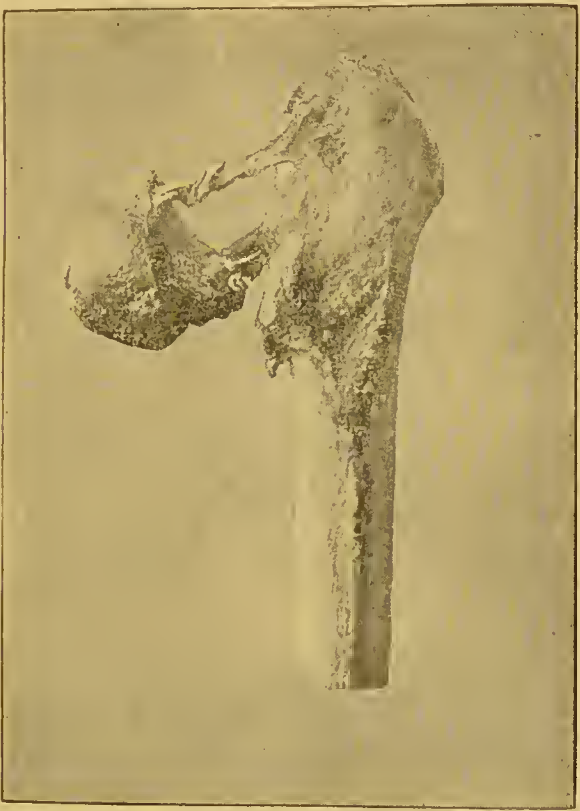

Fig. 9.—Fractures of cervix with laceration of cervical ligaments and absorption of cervix.

and a signal example of this is to be found illustrated in Professor Gross's work on surgery; but this is, I believe, due, not to any normal senile change, but to a partial absorption of the cervix, probably from contusion, which has ultimately the effect of approximating the head to the shaft of the bone.

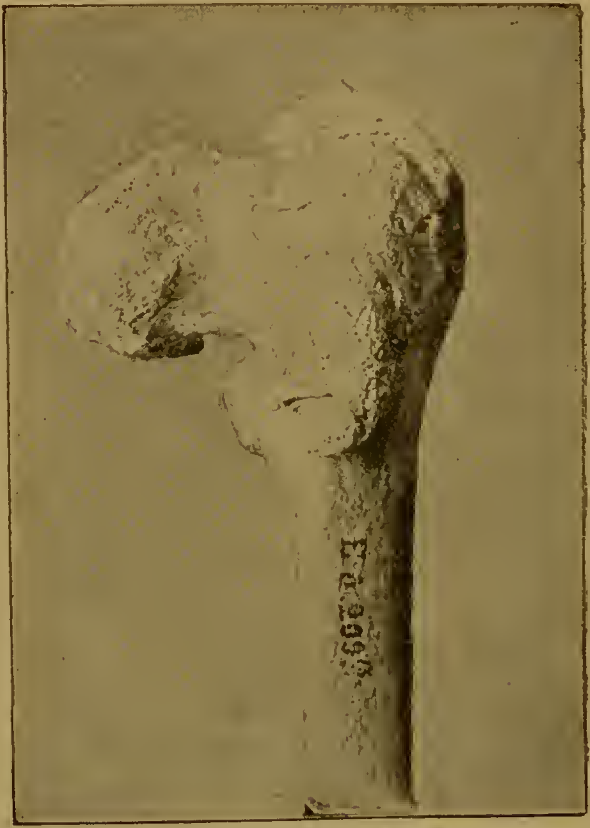

Fig. 10.—Fracture of base of cervix, partial impaction posteriorly.

It has been held by those maintaining the theory of senile alteration in the angle that there is an analogy between this and what, as everyone knows, takes place in the lower jaw. There is, however, nothing of the kind. In the case of the lower jaw, as Sir George Humphry has pointed out, the angle between the ramus and the body of the bone is rendered more obtuse by the effect of muscular action, drawing the angle forwards and upwards, there being no opposition to this force, in consequence of the loss of the teeth and the absorption of the alveolus. The result is an obliteration of the acuteness of the angle. No analogous process, of course, occurs at the junction of the cervix and the shaft of the femur.

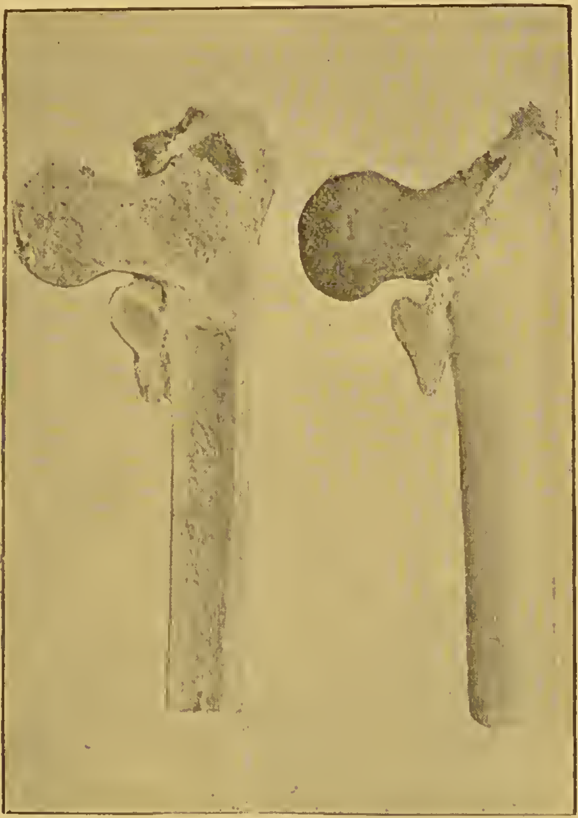

Fig. 11.—Fracture of base of cervix with complete impaction.

It may therefore, I think, be held as tolerably certain that we cannot connect, as so many have done, the frequent occurrence of fractures of the cervix in aged persons with any normal senile alteration in the angle between the axis of the cervix and the shaft.

As regards the many forms of fracture of the cervix femoris that we have to deal with, the varying position and limit of the capsule posteriorly, together with the fact that a large proportion of these fractures are, so to say, mixed — that is, partly within and partly without the capsule—sufficiently justify, I think, an abandonment of the classification adopted by Sir A. Cooper, R. W. Smith, Adams, and others, into intra- and extracapsular fractures. But although this classification may be anatomically or pathologically incorrect —"unscientific," as Mr. Bryant terms it—in a clinical point of view it is convenient, and, as far as this aspect

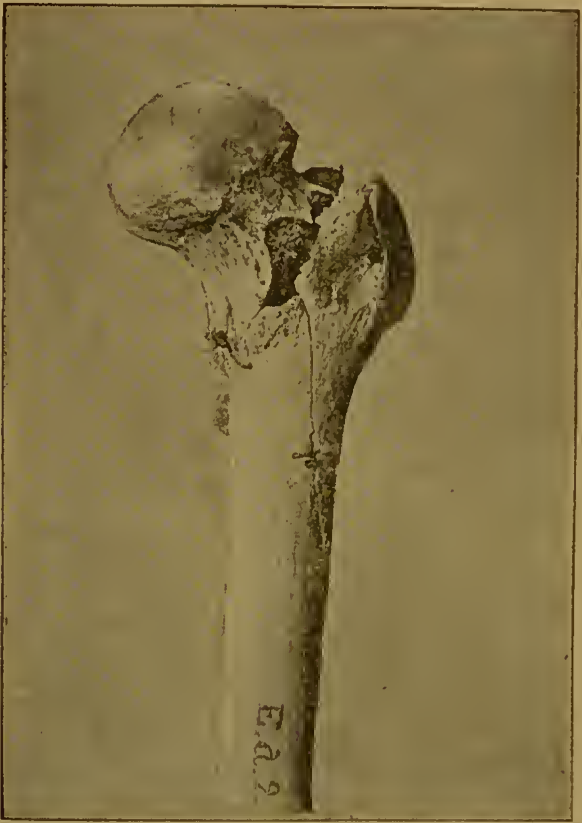

Fig. 12. Fracture of base of cervix, partial impaction below (shaft split).

is concerned, might be retained. In the accompanying scheme I have indicated in a tabular form what I think should be the accepted classification, adopting many of the subdivisions of intra- and extracapsular fractures suggested by the late Professor Gordon, of Belfast. In considering the subject of classification, I think it is desirable that a distinction should be made between fractures with and without penetration, and fractures with and without impaction. A similar distinction has been made by Professor Chiene in connection with fractures of the lower end of the radius, and I think it can with equal propriety be made in connection with fractures of the femoral neck or its base. Those within the capsule afford examples of the first group, those external to it the second. In reference to this classification I may mention that the majority of illustrations I desire now to submit to your consideration are from specimens belonging to the Museum of the Queen's College, Belfast, and I am indebted to the kindness of the distinguished Professor of Surgery there, Dr. Sinclair, for enabling me to exhibit them.

Fracture of Cervix Femoris (Intracapsular).

I. Fracture with penetration of cervix into head	With penetration.
II. Fracture with reciprocal penetration	
III. Intraperiosteal fracture of cervix at junction wtih head (transverse)	Without penetration.
IV. Intraperiosteal fracture at centre of cervix (transverse)	
V. Extraperiosteal fracture with lacertion of cervical ligaments	

Fracture of Base of Cervix Femoris (Extracapsular).

I. Fracture of base of cervix with partial impaction (posteriorly)	With impaction.
II. Fracture of base with complete impaction	
III. Fracturo of base with partial impaction above (angle obtuse)	
IV. Fracture of base with partial impaction below (shaft split)	
V. Longitudinal splitting of cervix	Without impaction.
VI. Comminutod fracture without impaction	

Among the fractures of the cervix there can be no doubt that the fifth variety is the one that is most frequently met with, and the one in which osseous union, owing to deficient nutrition, non-apposition of the fragments, synovitis, effusion of blood, and rapid insterstitial absorption, never takes place. The frequent occurrence of this result it doubtless was, that caused Sir A. Cooper, Cruveilhier, and others to fall into the error of maintaining that osseous union never takes place in intracapsular fractures. Now we know that in a considerable proportion of these cases osseous union take place, and before us we have many beautiful examples of this taken from the Museums of the College of Surgeons here and in Dublin, the Museum of the Royal University of Ireland, and that of the Queen's College, Belfast, and I here tender my grateful thanks to the authorities of these institutions for enabling me to submit, for the inspection of the members of the Association, the superb collection of specimens of these injuries which is now before them. There are two conditions which appear to be essential to the occurrence of osseous union—one, the integrity of the cervical ligament; and the other, the existence of one of the two forms of penetration, either (*a*) of the cervix into the head, or (*b*) reciprocal penetration. It would appear, therefore, that there are four different forms of fracture of the cervix in which osseous union may take place, provided the routine expectant treatment be abandoned.

It may, I think, also be held that the further from the base of the cervix the lesion is, the less is the chance of osseous union. The nutrition of the bone at the base is not so profoundly affected as in situations nearer the head, since in the latter it is derived chiefly through the medium of the cervical ligament, which is, as a rule, more or less torn or contused. The osteogenetic properties, too, of the fibrous envelope of the cervix appears to be almost nil, and absorption of the bone, the nutrition of which is so much impaired, appears to be carried on with exceptional activity, not merely in cases of fracture, but also in those of contusion; and the difficulties of maintaining fixation and rest are more prominent owing, among other things, to the rarity of penetration which is observed the nearer the lesion is to the head.

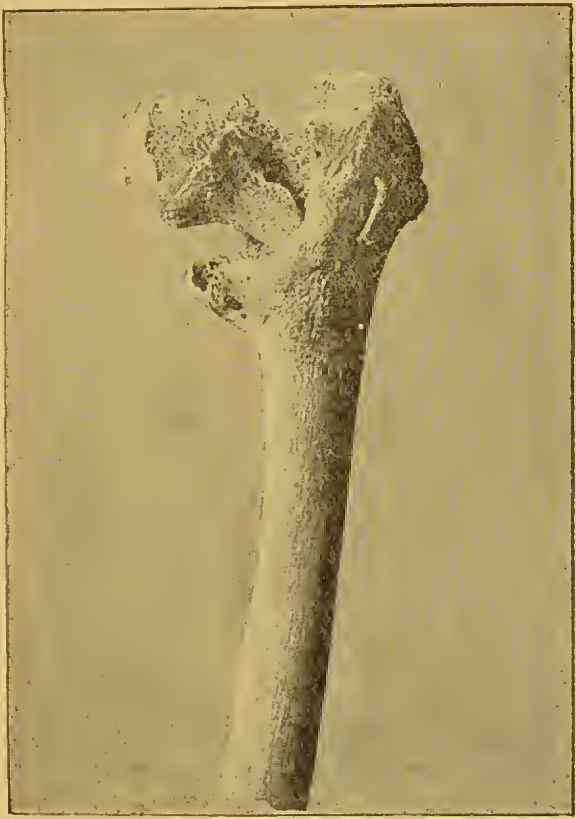

Fig. 13.—Fracture of base of cervix, longitudinal splitting of cervix.

In the second group, namely, the fractures of the cervical base, impaction in some form or other is the rule, and the amount of eversion which is present in almost all cases depend on the particular form of impaction that has occurred. The most usual is of the posterior cervical wall into the cancellous structure underneath the posterior intertrochanteric ridge, and the probable reasons why the posterior wall is so much more frequently impacted than the anterior are anatomical and mechanical. Among the former may be mentioned the capsular ligament being strengthened anteriorly by the powerful **Y**-shaped

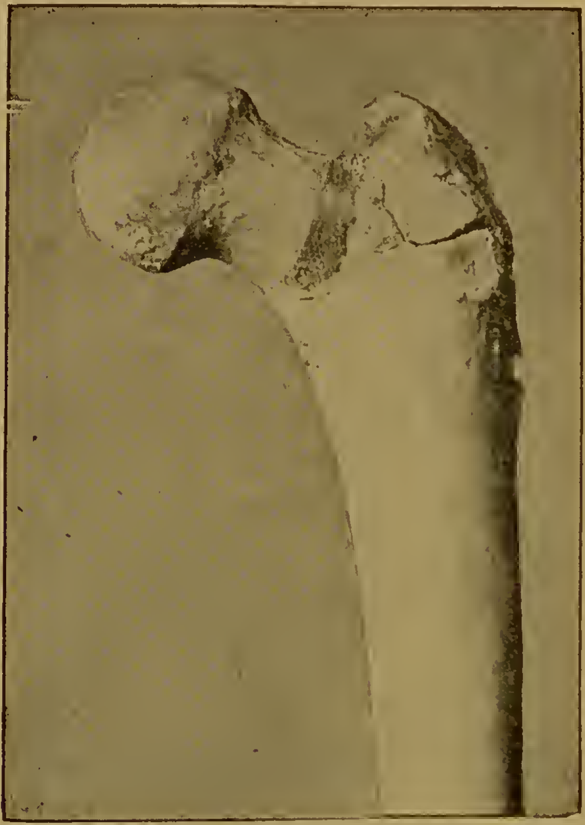

Fig. 14.—Comminuted fracture of base of cervix without impaction.

ligament, also by the retinacula of Weitbrecht being broader and stronger in front than behind, and the compact tissue of the cervix being thicker anteriorly than posteriorly. Again, when a person falls on the trochanter the point of impact lies, as a rule, behind the axis of the neck, and this would obviously predispose to posterior penetration.

In the second form the direction of the force is either in a line with or in front of the cervical axis; and in the third form Gordon held that by the accidental downward inclination of the ground on which the patient falls the greatest amount of shock is communicated to the upper part of the neck, resulting in impaction of the neck above and increase of the obtuseness of the angle, and in the fourth form, owing to the lower part of the base receiving the greatest amount of shock, and the base being particularly dense at this part, the shaft is split.

There is little difficulty in understanding the characteristic eversion that is observed in the vast majority of cases of fracture, either of the cervix or its base, due as Bigelow held, to a rotation of the fractured bone on a hinge formed in the anterior cervical wall. The theory of eversion being due to rotation of the shaft upon the base of the neck is, according to some, untenable, who hold that it is due to a rotation of the base of the neck upon the shaft, but few, I should think, would be disposed to accept this view.

The occasional occurrence of inversion in both groups of fractures of the cervix and its base is more difficult of explanation, and is a sign which in no small degree adds to the difficulties of differential diagnosis. Guthrie held that this unusual condition was confined to the extracapsular forms of fracture, the one, namely, through the great trochanter, a portion of it being continuous with the shaft of the bone: but this has been shown to be erroneous, as the condition has been observed in the fractures of the cervix within the capsular ligament. The late Professor Pirrie published a very remarkable case

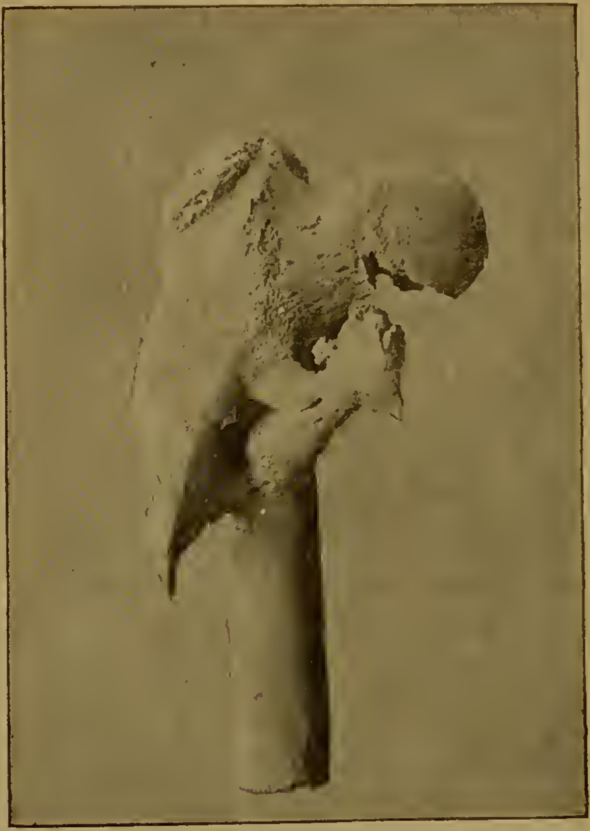

Fig. 15.—Rare form of fracture of the femur.

of extreme adduction, flexion, and inversion of the limb in a case of fracture of the cervix close to the head, at right angles to the axis of the neck. The patient died six weeks afterwards. The capsular and ilio-femoral ligaments were found uninjured, and to the integrity and tension of these ligaments Professor

Pirrie attributed the adduction, flexion, and inversion of the limb. It is hard to understand, on anatomical grounds, how the inversion could be explained satisfactorily in that way.

R. W. Smith held the view that the inversion was due to the altered action of the adductors, which became rotators inwards, owing to the lower fragment being displaced in front of the upper, so that the insertion of these muscles was in a plane anterior to their origin. If muscular action was the cause, however, the inversion would continue constant; but such is not the case. I can call to mind a case in which inversion was well marked, and a day or two

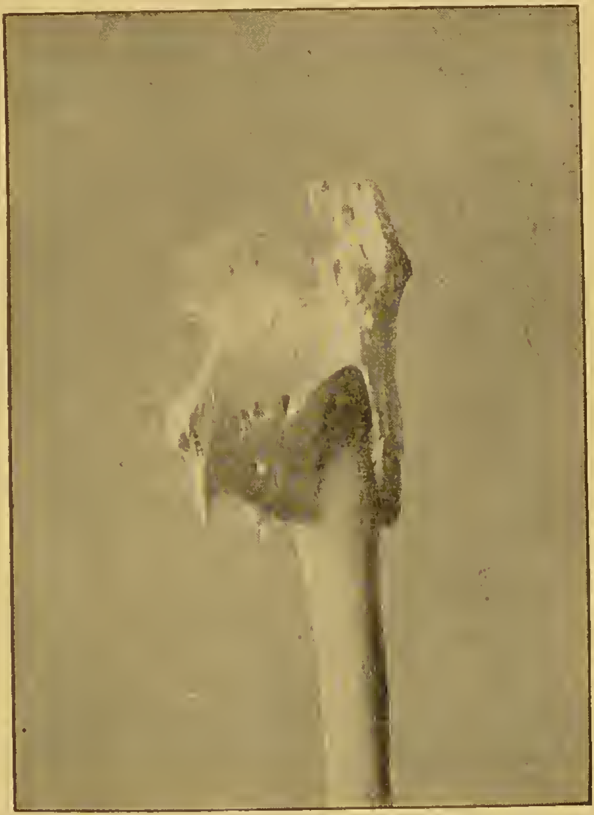

Fig. 16.—Rare form of fracture of the femur.

afterwards I found that the usual eversion had supervened. I think, therefore, the inversion is most probably due to the limb having been adducted and inverted at the time of the accident, and that afterwards the limb remained in the position it was at the time injury was sustained.

No part of this subject is of greater importance than the differential diagnosis, as the patient's future and the surgeon's reputation depend on a correct estimate of this being formed. The conditions with which fracture of the cervix or its base may be mistaken are luxation on the dorsum ilii, fracture of the brim of the acetabulum, fracture of its fundus, and contusion. The differentiation may as a rule be correctly made by bearing in mind that, whereas in fracture we have usually a history of a direct fall on the trochanter, followed by eversion, shortening, and backward direction of the outer surface of the trochanter, occurring in advanced life, and with marked pain along the line of fracture, diminished tension of extensor muscles, occasional inversion, and that not well marked; in luxation, on the other hand, we have a history of forced rotation inwards, rarity of occurrence in advanced life, usual inversion, great shortening, approximation of trochanter to anterior superior spine, head of bone on dorsum ilii, movements difficult and restrained, absence of pain on trochanter, increased tension of extensor muscles, and constant, well-marked inversion. In fractures of the brim of the acetabulum we have the head drawn upwards and backwards, with detached fragment of brim, shortening, inversion, crepitus, adduction, recurrence of shortening after extension is removed, and power of eversion and abduction of the limb. In fractures of the fundus we have usually comminution, head passing into the pelvis, shortening, liability to abscess formations, and generally a fatal result. In contusion we have a preservation of the normal relations between the anterior superior spine and trochanter preserved at first, but often ultimately lost, and the knowledge that pre-existing chronic rheumatism may in these cases accentuate the difficulty of differentiation in no small degree.

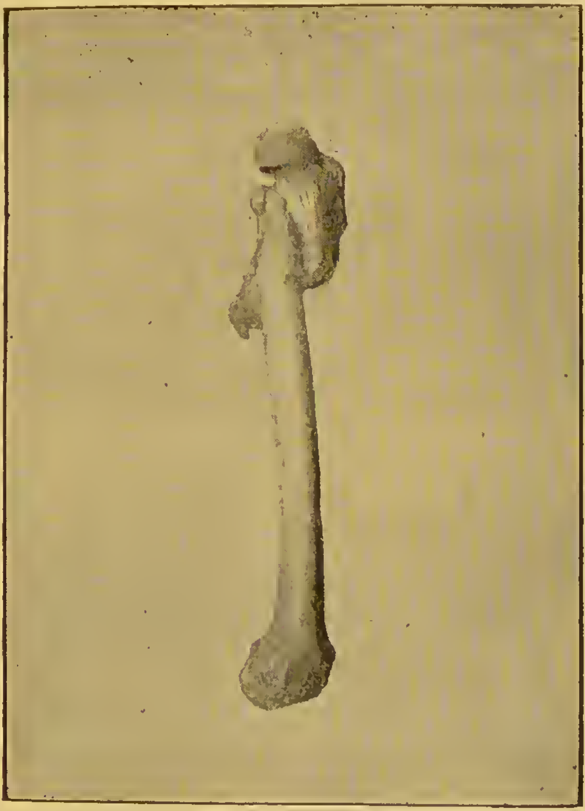

Fig. 17.—Rare form of fracture of the femur.

I have here tabulated these points of difference, and a reference to the leading signs and symptoms of them, grouped side by side, may facilitate our forming a correct diagnosis.

Differential Diagnosis.

Fracture of base of Cervix (Extra-capsular.)	Dislocation on Dorsum Ilii.	Fractures of the Brim of Acetabulum.	Fractures of Fundus of Acetabulum.	Contusion.
Common in advanced life.	Rare in advanced life.	—	—	Relation between anterior subspine and trochanter on both sides the same at first.
History of direct fall on trochanter.	History of forced rotation inwards of femur.	—	—	
Shortening.	Shortening greater	Shortening	Shortening	Pre-existing chronic rheumatism. a cause of great difficulty in forming a right estimate of the case. Note the previous history, and observe that the powerless state induced by the injury soon passes off.
		Shortening recurring after extension is removed.		
Eversion usual		Inversion		
Inversion rare	Inversion constant.			
Inversion slight (Guthrie).	Inversion well marked.	Power of eversion.		
		Adduction.		
Movements comparatively easy.	Movements difficult and restrained	Power of widely abducting limb.		
		Flexion of knee.		
Head in acetabulum.	Head on dorsum ilii.	Head drawn upwards and backwards with detached fragment at brim.	Head passes into pelvis	
Outer surface of trochanter looking backwards.	Approximation of trochanter to anterior subspine.	Crepitus	Fracture comminuted, star shaped	
Pain along line of fracture in front, above, and behind.	No pain on pressure over trochanter		Liability to formation of abscesses in iliac fossa.	
Diminished tension of extensor muscles (Lagoria)	Increased tension		Accident generally fatal	

As regards the treatment of these injuries there is still much diversity of opinion. The employment of fixation and extension has been by many condemned as a useless and irrational practice on the grounds that as the trochanteric fragment is approximated and more or less fixed to the acetabulum by the obturators, gluteus minimus, and pyriformis, so by rotating the limb inwards and extending, the base of the neck is, as Professor Gordon held, separated from the trochanter, posteriorly at all events, and the shaft from the head and neck. The fragments, in fact, are drawn asunder, thus diminishing the chances of osseous union. In addition to these alleged disadvantages there are those which undoubtedly attend keeping the patient, especially if advanced in years, for a considerable time in the recumbent position. For these reasons the routine treatment formerly was a very simple one, consisting practically in doing nothing at all, the rule adopted being to let them (the patients) select their own position and support the limb in any way they pleased.

This simple but, as a rule, ineffective method of treatment is no longer, I think, generally accepted. Professor Senn instituted in 1883 a series of interesting experiments on cats and dogs, with the object of determining what will best promote the chances of osseous union in fractures of the cervix femoris. In a large proportion of cases, when the required conditions were obtained by drilling and subsequent fracture of the cervix, and when, in the after-treatment, nothing was done except to keep the limb in a gypsum bandage, there was no attempt even at the formation of bony union. In a second series of cases the treatment of a more thorough immobilisation was adopted by fixing, namely, the fragments with ivory, bone, or metallic nails. In ten of such experiments bony union was obtained in most of them. The ivory and bone nails were usually found absorbed, the metallic ones encysted. The importance of these experiments consists in demonstrating that the more perfect the fixation and immobilisation are, the greater is the chance of bony union, and the conclusion is irresistible that the surgeon should be cautious not to break down or disturb any penetration or impaction that may be present. Consequently, with the view of securing permanency of the impaction, Professor Senn has introduced the principle of making lateral pressure in the direction of the axis of the cervix by a pad which rests on the external surface of the great trochanter, and the necessary pressure made by a screw action, which can be regulated from day to day. In non-impacted fractures the fractured surfaces should be brought into perfect mutual apposition, and in this position the affected limb, pelvis, and thigh on the opposite side should be encased in a plaster-of-paris dressing, all of the bony prominences being well protected by salicylic wool. In this dressing Professor Senn combines the application of his splint, in which provision is made for the lateral pressure.

Some surgical authorities, Sir John Erichsen among the number, consider that in an extracapsular impacted fracture a limb cannot be restored by traction to its normal length, and that nothing can be done to diminish the deformity, the patient remaining throughout life more or less crippled. Recently there seems to be evidence of a tendency for the pendulum of surgical opinion to swing to the opposite side, for with the view of preventing or diminishing the permanently crippled condition that Sir J. Erichsen speaks of, Mr. Southam, of Manchester, has practised and advocated a deliberate breaking down of impaction, instead of leaving it intact as surgeons hitherto have aimed at doing. The patient whose case Mr. Southam has published,* was aged 27 years, and all the usual signs and symptoms of extracapsular fracture of the neck of the femur were present. The patient was anæsthetised, the impaction broken down, and the excision and shortening being overcome, the fracture was then treated by extension. "The fracture readily united with the limb in the corrected position, no deformity ensuing."

It is possible that in the treatment of this case Mr. Southam may be the pioneer, so to speak, of a revolution in the routine practice adopted in such instances. As far as one can judge from a single example I should say that the treatment could only be applicable in a very limited number of cases, namely, those rare ones that occur at a period of life long antecedent to that of any senile anatomical change, and when the physical reparative powers are in full activity. In no other case, I should imagine, having regard to the senile changes in the bones to which I have alluded, could the practice be adopted with any reasonable hope of success. I have pointed out that in four different varieties of fractures of the cervix (intracapsular) osseous union, and that with little or no deformity, can take place.

This satisfactory result is the result of one or other of two conditions being present, namely, penetration or the preservation of the integrity of the Stanley-Smith cervical ligament. When either or both of these conditions are present as well as the absence of any marked senile structural change osseous union may take place in consequence of the proper and permanent apposition of the broken ends of the bone. Our object, therefore, should be to bring about this condition as far as is practicable by artificial means, and this can best be done by rest fixation of the limb, and as much extension as will aid in promoting these two latter essential conditions. I have not as yet tested Professor Senn's method, of lateral pressure, but in my experience the necessary conditions can best be fulfilled either by Mr. Bryant's double splint, or, I hope I may say without vanity, by the screw extension combination splint which I have devised and employed, not merely in the treatment of various fractures of the lower extremity, including those of the cervix femoris and its base, but also in certain forms of chronic articular disease. Whatever apparatus is employed, it should be remembered that two things are essential, especially in dealing with very aged persons: First,. to have provision for enabling the patient to sit up occasionally, not allowing him to remain long in the recumbent position; and secondly, that the extension be not greater than will promote immobility; in other words, care should be taken not to have any violent and useless contest set up between muscular and mechanical forces—a condition necessarily antagonistic to, if not incompatible with, that rest, fixation, and freedom from pain which are so essential to the satisfactory union of all wounds, whether of bones or soft structures.

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* *Lancet*, November 17th, 1894.

From the preceding considerations, we are, I think justified, in forming the following conclusions:

1. The alleged senile alteration in the angle between the axis of the cervix and the shaft of the femur does not occur, and cannot therefore be regarded, as it has hitherto been, as a predisposing cause of fracture of the cervix femoris.

2. That the process of absorption in the case of fracture is probably due primarily to senile osteoporosis, and secondly to the twofold action of the absorbents on the one hand and friction of the broken fragments on the other, and, in the case of contusion, of impaired nutrition consequent on a low form of synovio-periosteal inflammation.

3. That in classifying fractures of the cervix or its base a distinction should be made between those with and without penetration, and those with and without impaction.

4. That osseous union may take place in four out of the five different forms of fracture of the cervix femoris.

5. That the further the fracture is from the base of the neck, the less is the probability of osseous union.

6. That fracture of the cervix may occur previously to epiphysial junction.

7. That the differentiation of these injuries lies between fracture of the cervix or its base, luxation, fracture of acetabular brim, of acetabular fundus, and contusion.

8. That the principles of treatment should be fixation, rest, and moderate extension.